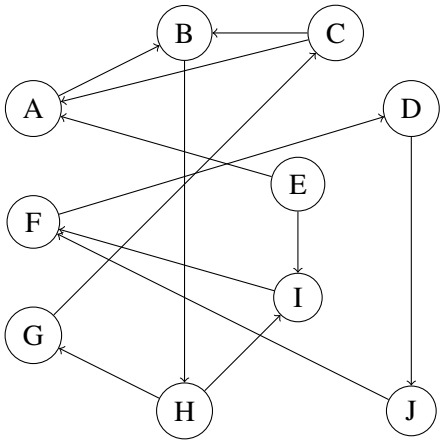
CMPSC 465 Data Structures & Algorithms
Spring 2024 Mehrdad Mahdavi and David Koslicki

Worksheet 6

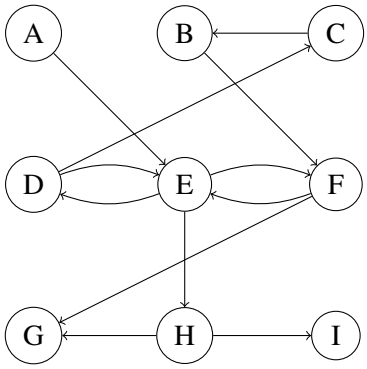
Wednesday, Feb 21, 2024

1. **Strongly Connected Components.** Run the strongly connected components algorithm on the following directed graphs and draw their SCC metagraphs. When doing DFS on the reverse graph G^R: whenever there is a choice of vertices to explore, always pick the one that is alphabetically first.

(i)



(ii)



2. **Award Ceremony.** Your job is to prepare a lineup of n awardees at an award ceremony. You are given a list of m constraints of the form: awardee i wants to receive his award before awardee j. Design an algorithm to either give such a lineup that satisfies all constraints, or return that it is not possible. Your algorithm should run in $O(|V|+|E|)$ time.

3. **Hamiltonian Path.** Given a directed acyclic graph G, write a linear-time algorithm to determine whether there exists a path that touches every vertex exactly once (a Hamiltonian Path).

4. **Odd Cycle.** Give a linear-time algorithm to find an odd-length cycle in a *directed* graph. (*Hint:* First solve the problem under the assumption that the graph is strongly connected.)